MEXICO'S GASOLINE MARKETS: A STUDY OF THE CONSUMER WELFARE IMPACTS OF PRICE LIBERALIZATION AND PERMIT CURTAILMENT.

Section 1: Summary

This paper estimates the consumer welfare impact of liberalizing gasoline prices in Mexico after over 80 years of government-mandated price controls and subsequent restrictions on gas station openings. Using a natural experiment that resulted in a two-tiered pricing regime in two cities, I estimate the heterogeneous demand for gasoline among households (HHs) as a spatially differentiated good, employing a random coefficients model. I estimate HH price sensitivity and their implicit valuation of product availability. My findings reveal that for every peso gained in welfare from increased product availability, HHs lose two pesos due to the rise in prices. The aggregate impact on welfare in these two cities is a loss of 1.4 billion pesos per year, roughly 7% of annual gasoline sales. In absolute terms, high-income HHs bear the brunt of price increases since they consume most of the gasoline. However, as a proportion of income, lower-income HHs are the most affected. The city-year price elasticity, as estimated using the random coefficients model, ranges between -0.42 and -0.64, in line with previous estimates for the US and being an order of magnitude higher than previous estimates for Mexico.

Section 2: Context, data, and model

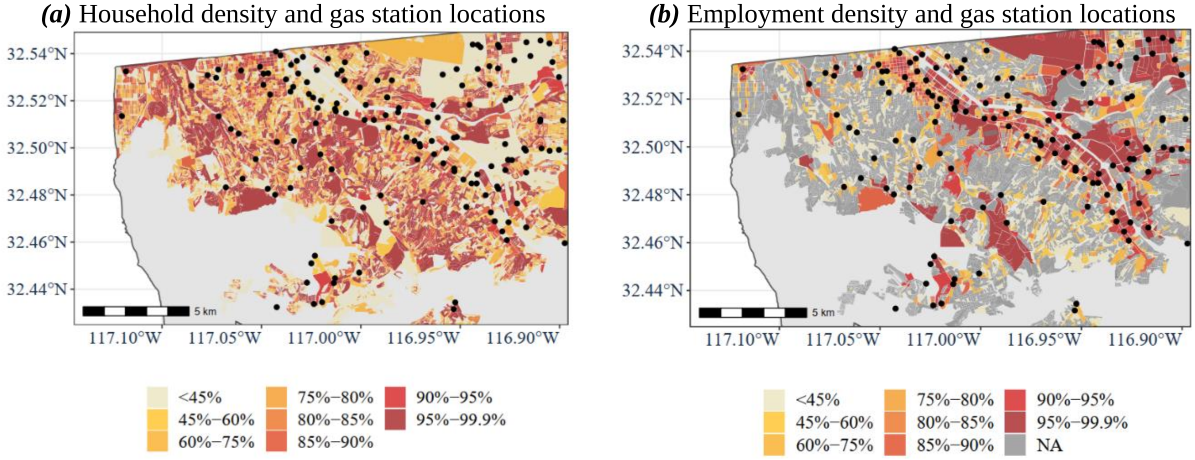
Up until 2013, Mexico's retail gasoline market was characterized by heavy regulation that forced gas station operators to charge administered prices, sell the same fuels, and carry the same brand regardless of their location. Following the implementation of Mexico's Energy Reform (MER) in 2013, several restrictions were sequentially lifted, culminating in 2017 when gas station operators were allowed to set their prices freely and diversify brands. In addition to MER, a new government administration enacted a new set of policies that reduced the opening of new gas stations by 70% from the average yearly permits granted from 2003 to 2017.

This paper studies retail gasoline demand in 2015 when all gas stations in Mexico still carried the same brand, sold the same fuels, and prices were determined formulaically at the federal level by the Ministry of Finance (MoF), and not by local competitive pressures. However, during this year, the MoF established two pricing zones for cities close to the U.S. border: gas stations 20km from the border were assigned a "low" price, and stations further south charged the same price as the rest of the country. The formulaic approach and the two-tiered fixed-price regime provide price variation that is plausibly exogenous from local competitive pressures as well as local demand shocks.

I use a unique proprietary data set, which took two years to compile, where I observe all 449 gas stations, their sales and characteristics. Additionally, I use highly detailed data for the border cities of Tijuana and Mexicali, including the location of HHs, employers, and gas stations (**Figures 1a and 1b show these maps for Tijuana)**. I also incorporate publicly available data to observe block-level demographic characteristics such as income.

Figure 1: Location of gas stations in comparison to household location and employment location (Tijuana)

(a) Household density and gas station locations ***(b)*** Employment density and gas station locations



Note: Color indicates the percentile in the distribution of the number of HHs living/working in each block, respectively

I estimate HH demand using the Berry, Levinsohn, and Pakes (1995) (BLP) model, incorporating a spatial component as in Thomadsen (2005) and Davis (2006). This model allows for the estimation of different price sensitivities among HHs with varying income levels. I model the utility of visiting a gas station and refueling as:

$$u_{ijk} = \gamma_i + \alpha_i(y_{ik} - p_{jk}) + \beta x_{jk} - \lambda_1 d_{ijk} - \lambda_2 d_{ijk}^2 + \xi_{jk} + \epsilon_{ijk} \quad (1)$$

where p_{jk} is the price at the pump for gas station j in market k and y_{ik} is the level of income of HH i. Following Hotelling (1929) and D'Aspremont (1979), d_{ijk} represents the Euclidean distance from HH i to gas station j. Consumers also derive utility from non-distance attributes; x_{jk} includes observed on-site characteristics like the presence of a convenience store, an ATM, services like oil changes, or the acceptance of gas vouchers. Consumers are also known to refuel while commuting or near home (Kitamura and Sperling, 1987). To capture this, I include a dummy variable indicating if a gas station is close to a big employer, as shown in **Figure 1b**. The variable ξ_{jk} consists of unobserved attributes; to account for endogeneity, I use BLP and Walfogel-Fan instruments (Gandhi and Nevo, 2021). The variable ϵ_{ijk} are independent and identically distributed shocks from a type-1 extreme value distribution.

After estimating the HH demand for gasoline, I estimate the change in HH welfare associated with MER. To do so, I simulate a counterfactual scenario where retail prices are still determined by the MoF's formulaic approach, which is primarily dependent on observed international oil prices. I compute the counterfactual outcomes for prices, quantity consumed, taxes collected, and HH welfare.

Section 3: Results and Insights

Parameter estimates of **equation 1** are shown in **Table 1**. The results indicate that, on average, consumers dislike paying money at the pump (α) and exhibit an increasing aversion to driving to a gas station (λ_2). I find that the market-level elasticity ranges from -0.42 to -0.64, which is not statistically different from the latest elasticity estimates for the U.S. (Kilian and Zhou, 2024; Colina et. al, 2024). However, these estimates are an order of magnitude higher than previous estimates for Mexico (Diaz and Medlock, 2021). Additionally, there is vast heterogeneity in HH preferences: HHs in the lowest income decile are 50% more price-sensitive than those in the highest decile (**Figure 2**).

Table 1: Estimation of mean parameters of demand

Parameter name	*Estimate*	*s.e.*
:: Intercept	74.4 ***	0.02
:: Prices (α)	-3.96 ***	1.53
:: Avg. dist (λ_1)	0.88 ***	0.33
:: Avg dist sq. (λ_2)	-0.15 ***	0.06
:: Big business	0.12 *	0.07
:: Conv. Store	-0.07	0.07
:: ATM	0.30 ***	0.08
:: Accepts vouchers	0.19	0.26
:: Sells oil	-0.13	0.16
Market	Mexicali	Tijuana
:: Elasticity	-0.42	-0.64

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 2: Median price elasticity by income decile

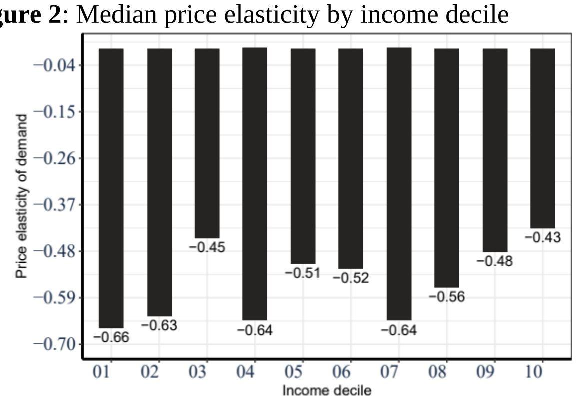


Figure 3: Welfare change for median HH by income decile

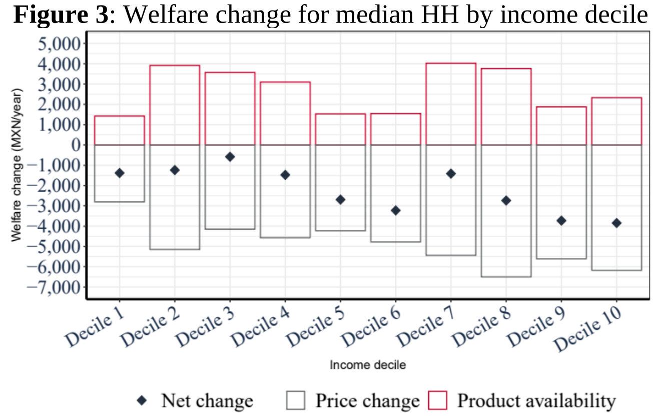
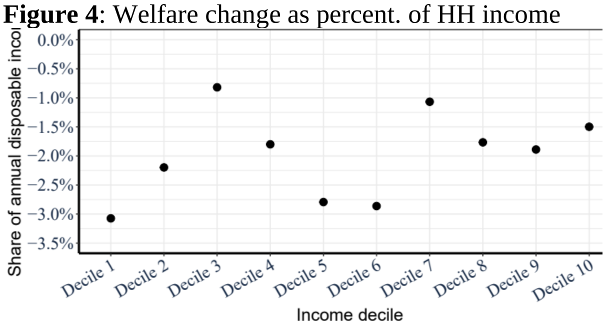


Figure 4: Welfare change as percent. of HH income



In terms of welfare, high-income HHs are the most affected, as they consume the most gasoline. Low-income HHs are impacted by a reduction in transfers due to less taxation. While HHs value product availability, on average, the ratio of losses to benefits is 2:1 (See **Figure 3**). In aggregate, the welfare loss is approximately 7% of the annual market revenue. As a proportion of income, this set of policies is regressive, with lower-income HHs losing the equivalent of 3% of their annual income, while high-income HHs lose around 1.5% (see **Figure 4**).

Section 4: Policy implications

From a regulatory perspective, I find that consumers value product availability. These results are relevant for informing the appropriate level of permit curtailment. From an environmental perspective, the findings show that Mexican consumers are an order of magnitude more price-sensitive than previously thought, which increases the feasibility of policies like carbon taxing. Future research will further explore the distributional effects of taxation and transfers.

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